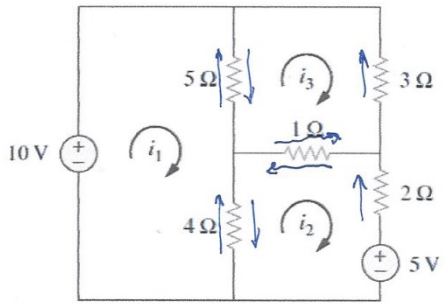
CERTAMEN # 1
TEORÍA DE CIRCUITOS 1
05 – Noviembre – 2020

Ejercicio 1 : (1,5 puntos)

Para el circuito de la figura: a) encuentre las corrientes de malla i1, i2, i3; b) determine la potencia suministrada por las fuentes de voltaje; c) calcule la potencia en la resistencia de 5 ohm



a)

$$10 = 5(i_1 - i_3) + 4(i_1 - i_2)$$

$$5 + 2 i_2 + 1(i_2 - i_3) + 4(i_2 - i_1) = 0$$

$$1(i_3 - i_2) + 5(i_3 - i_1) + 3 i_3 = 0$$

$$9i_1 - 4i_2 - 5i_3 = 10$$
$$4i_1 - 7i_2 + i_3 = 5$$
$$-5i_1 - i_2 + 9i_3 = 0$$

$$\begin{bmatrix} 9 & -4 & -5 \\ 4 & -7 & 1 \\ -5 & -1 & 9 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \\ 0 \end{bmatrix}$$

$i_1 = 2,085\ (A)$
$i_2 = 0,65\ (A)$
$i_3 = 1,23\ (A)$

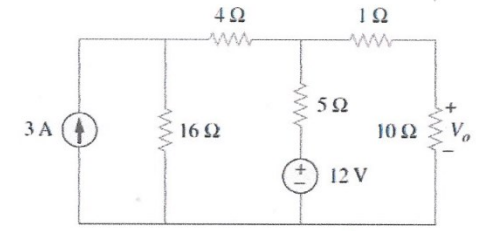
b) $P_{F_1} = 10 \cdot 2,085 = 20,85\ (W)$

$P_{F_2} = 5 \cdot (-0,65) = 3,25\ (W)$

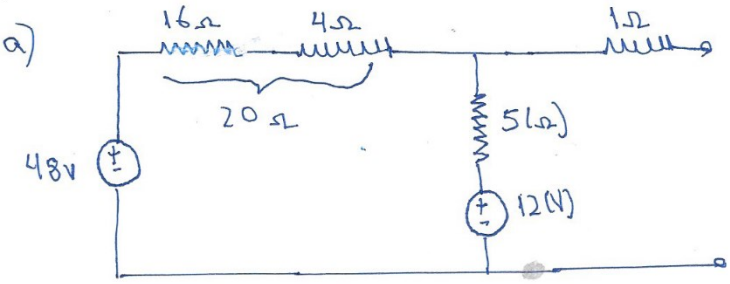
c) $P_{R=5} = (i_1 - i_3)^2\, 5 = (2,085 - 1,23)^2 \cdot 5 = 3,65\ (W)$

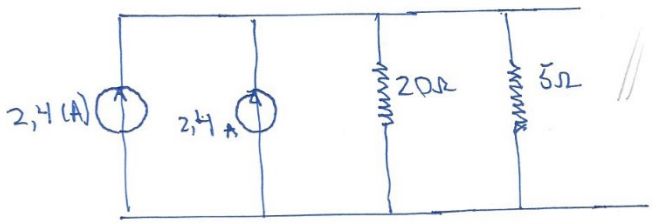
Ejercicio 2 : (1,5 puntos)

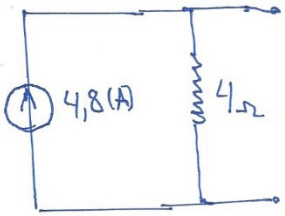
En el siguiente circuito se requiere: a) encontrar el Circuito equivalente de Thevenin y el circuito Equivalente de Norton; b) calcular la tensión Vo en la resistencia de 10 Ohm.

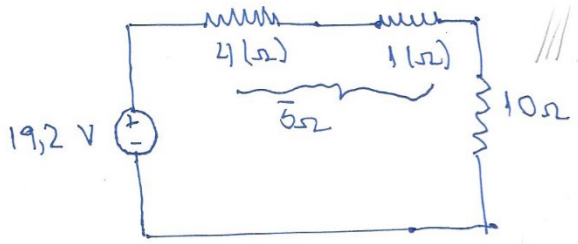


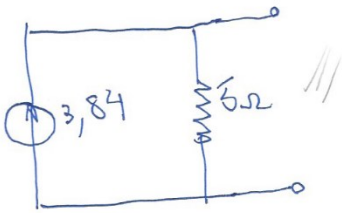
a)







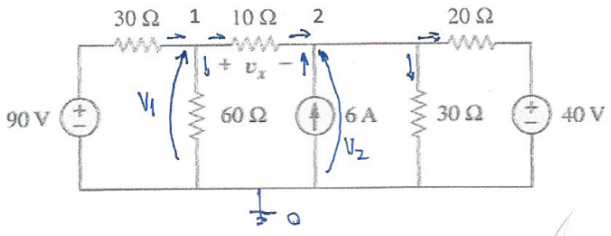




b) $V_o = 19{,}2 \times \frac{10}{10+5} = 12{,}8\ (V)$

PROBLEMA 3

a) Mediante el método de tensiones de nodos, determine las tensiones en 1 y 2.
b) Determinar la tensión Vx
c) Calcular la potencia suministrada por cada una de las fuentes.



a)

$$\frac{90 - V_1}{30} - \frac{V_1}{60} - \frac{V_1 - V_2}{10} = 0 \quad / \times 60$$

$$6 + \frac{V_1 - V_2}{10} = \frac{V_2}{30} + \frac{V_2 - 40}{20} \quad / \, 60$$

$$180 - 2V_1 - V_1 - 6V_1 + 6V_2 = 0$$

$$360 + 6V_1 - 6V_2 - 2V_2 - 3V_2 + 120 = 0$$

$$9V_1 - 6V_2 = 180$$

$$-6V_1 + 11V_2 = 480$$

$$\begin{bmatrix} 9 & -6 \\ -6 & 11 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 180 \\ 480 \end{bmatrix} \quad V_1 = 77,14\,(V) \quad V_2 = 85,71\,(V)$$

b) $V_x = V_1 - V_2 = 77,14 - 85,71 = -8,57\,(V)$

c) $i_1 = \frac{90 - V_1}{30} = \frac{90 - 77,14}{30} = 0,43\,(A)$

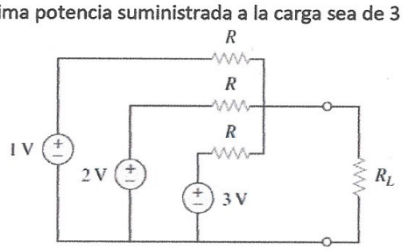
$P_1 = 90 \cdot i_1 = 90 \times 0,43 = 38,58\,(W)$

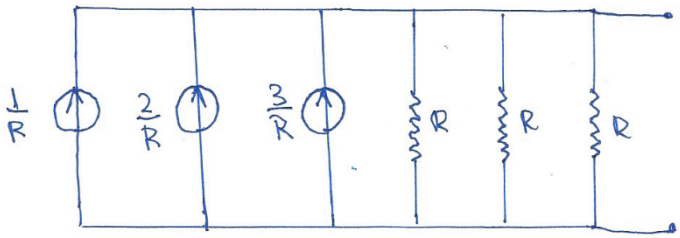
$P_2 = 6 \cdot V_2 = 6 \times 85,71 = 514,26\,(W)$

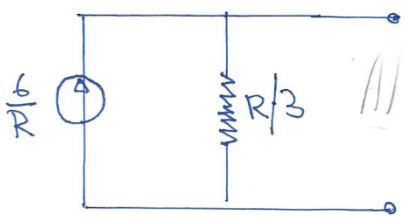
$P_3 = 40\left(\frac{40 - V_2}{20}\right) = 40 \cdot \left(\frac{40 - 85,71}{20}\right) = -91,42\,(W)$

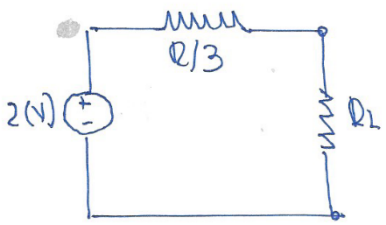
Ejercicio 4 : (1,5 puntos)

En el circuito de la figura mediante transformación de fuentes determine el valor de la resistencia "R" de manera que la máxima potencia suministrada a la carga sea de 3 mW









$$P_{max} = \frac{V_{th}^2}{4\ R_{th}} \rightarrow R_{th} = \frac{V_{th}^2}{4 \cdot P_{max}} = \frac{4}{4 \cdot 3 \times 10^{-3}} = \frac{1}{3} K\ (\Omega)$$

$$\frac{R}{3} = \frac{1}{3} K \rightarrow R = 1000\ (\Omega)$$